

Work Order ID 81517

\*81517\*

Page 1

May-31-12 7:55:38 AM

Item ID: D350-748-101

Accept

\*N900040100\*

Setup Start

\*NS1\*

Revision ID: U/R

Stop

\*NS2\*

Item Name: Crosstube Installation, High Fwd

Start Date: 3/15/12 Start Qty: 1.00

\*1\*

Cust Item ID:

Required Date: 4/04/12 Req'd Qty: 1.00

\*1\*

Customer:

Reference:

Run Start

\*NR1\*

Approvals:

Process Plan:

Date:

Tooling:

Date:

Stop

\*NR2\*

QC:

Date:

SPC (Y/N):

Date:

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

Draw Nbr	Revision Nbr								
D350-748-141	FUR OK AP 12/4/25	0.00							
100	DOCUMENT CONTROL	0.00							
*100*									
DC	Memo	0.00							
Document Control	Photocopy bluefile & type labels per PPPD350-748-101								

110	BENDING MACHINE - CROSSTUBES	0.00							
*110*									
CNC Bend 1	Memo	0.00							
CNC Delta 100 Bender	Bend tube as per Dwg D350-748-141 using CNC bender program D350F and Folio FT								

120	QC15- Crosstube Dimensional Check	0.00							
*120*									
QC	Memo	0.00							
Quality Control									

Issue P/O to Met Cor P/O: ~~16942~~ 16942 CL 12/06/04  
 Rec'd + inspect attached cage to w/o  
 P/P/18

Work Order ID 81517

\*81517\*

Page 2

March-15-12 8:42:50 AM

Item ID: D350-748-101

Accept

\*N900040100\*

Setup Start \*NS1\*

Revision ID: U/R

Stop \*NS2\*

Item Name: Crosstube Installation, High Fwd

Start Date: 15/03/2012 Start Qty: 1.00

\*1\*

Cust Item ID:

Required Date: 04/04/2012 Req'd Qty: 1.00

\*1\*

Customer:

Reference:

Approvals: Process Plan: Date:

Tooling: Date:

Run Start \*NR1\*

QC: Date:

SPC (Y/N): Date:

Stop \*NR2\*

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
125		0.00							
<b>*125*</b>									
HandFXtube	<b>Memo</b>	0.00							
Hand Finishing Crosstubes	***Stress relief*** Heat treat crosstube as per QSI010 4.3 Temp: _____ Start time: _____ Finish time: _____								
127	QC6- Inspect dimensions to drawing	0.00							
<b>*127*</b>									
QC	<b>Memo</b>	0.00							
Quality Control									

5/12/12

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval Q/c Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

**Work Order ID 81517****\*81517\***

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March-15-12 8:42:50 AM

Item ID: D350-748-101

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**\*N900040100\***Setup Start **\*NS1\***

Revision ID: U/R

Stop **\*NS2\***

Item Name: Crosstube Installation, High Fwd

Start Date: 15/03/2012 Start Qty: 1.00

**\*1\***

Cust Item ID:

Required Date: 04/04/2012 Req'd Qty: 1.00

**\*1\***

Customer:

Reference:

Approvals:

Process Plan:

Date:

Tooling:

Date:

Run Start **\*NR1\***

QC:

Date:

SPC (Y/N):

Date:

Stop **\*NR2\***Sequence ID/  
Work Center IDOperation  
DescriptionSet Up/  
Run Hours

Tool ID

Tool #

Plan  
CodeAccept  
QtyReject  
QtyReject  
NumberInsp.  
Stamp

130

0.00

**\*130\***

Crosstubes

Crosstubes

Memo

0.00

Crosstubes

1-Drill Tube as per Dwg D350-748-141 Using DT8876 A,B &C Drill Jigs,  
Set-up drill table as per QSI 010

2-Deburr

3-Engrave Part # and Batch # as per Dwg D350-748-141

4-Remove all marks from tube within limits of D350-748-141

5- Apply a light coat of LPS3 on the interior of tube

Batch: W/AS

140

QC5- Inspect part completeness to step on W/O

0.00

**\*140\***

QC

Quality Control

Memo

CHECK 10 DEG HOLES WITH DT8876E (EUROCOPTER CLAMP)

0.00

8/2/05/36

12-5-22  
12-5-22

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval Q/I Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_  
 Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			
		552-51	6/1					

**NOTE:** Date & initial all entries

# Work Order ID 81517

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March-15-12 8:42:50 AM

Item ID: D350-748-101

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**\*N900040100\***

Setup Start **\*NS1\***

Revision ID: U/R

Stop **\*NS2\***

Item Name: Crosstube Installation, High Fwd

Start Date: 15/03/2012 Start Qty: 1.00 **\*1\***

Cust Item ID:

Required Date: 04/04/2012 Req'd Qty: 1.00 **\*1\***

Customer:

Reference:

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Run Start **\*NR1\***

QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop **\*NR2\***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

150

Outsource process-Cadplate per QSI017 4.1.9.1

0.00

**\*150\***

Outsource3

Memo

0.00

Outsource process - Cad plate

Issue P/O: 17084  
Stress relief at 375° for 5 hours  
Magnetic Particle Inspect per ASTM E1444  
Cadium Plate per AMS-QQ-P-416B, Class 1, Type 2  
Embrittle relief at 375° for 8 hours, Chromate Treat  
Possible Supplier: Southwest United Industries  
Ensure Certificate of Conformity is attached

CA 12/06/04 (1)

160

Receive & Inspect for Damage & Mat'l Certs

0.00

**\*160\***

Packaging

Memo

0.00

Packaging

Ensure certificate of conformity is attached

12/07/10 (1)  
12/24/10 (1)

170

QC5- Inspect part completeness to step on W/O

0.00

**\*170\***

QC

Memo

0.00

Quality Control

Soladice  
SEE W/O CAG, OVER

12-03-15  
RELE

AP

# Dart Aerospace Ltd

W/O: 21517		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector
12.03.15	171	LOAD TEST TO 3500 lb FOR 1 MINUTE	<i>[Signature]</i>	12/6/10	1	<i>[Signature]</i> 12.03.15 05/07/12	<i>[Signature]</i> 05/07/12
12.03.15	172	NDT P10: 17258 C212100/19 <i>rec'd 12/4/15</i>				<i>[Signature]</i> 12.03.15 05/07/12	<i>[Signature]</i> 12/04/15

Part No: 0350-748-101 PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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March-15-12 8:42:50 AM

Item ID: D350-748-101

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**\*N900040100\***Setup Start **\*NS1\***

Revision ID: U/R

Stop **\*NS2\***

Item Name: Crosstube Installation, High Fwd

Start Date: 15/03/2012 Start Qty: 1.00

**\*1\***

Cust Item ID:

Required Date: 04/04/2012 Req'd Qty: 1.00

**\*1\***

Customer:

Reference:

Approvals:

Process Plan:

Date:

Tooling:

Date:

Run Start **\*NR1\***

QC:

Date:

SPC (Y/N):

Date:

Stop **\*NR2\***Sequence ID/  
Work Center IDOperation  
DescriptionSet Up/  
Run Hours

Tool ID

Tool #

Plan  
CodeAccept  
QtyReject  
QtyReject  
NumberInsp.  
Stamp

180

0.00

**\*180\***

SprayPaint

SprayPaint

Memo

0.00

Spray Painting

1-Prime inside crosstube as per QSI 005 4.2

2-Prime Outside of Tube as per Dart QSI 005 4.2

190

QC14- Inspect Spray Paint

0.00

**\*190\***

QC

Memo

0.00

Quality Control

Then, Wrap in plastic bag to protect from scratches

200

0.00

**\*200\***

Crosstubes

Crosstubes

Memo

0.00

Crosstubes

1-Install Ground wire Insert, then insert screw and washer

2-Install Abrasion strips as per Dwg D350-748-141 &amp; QSI 035.

3-Install supports Using Dt8876 as per Dwg D350-748-141, Torque to 60-80 IN-LBS

① 12-06-22

A8 12-6-22



W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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**\*N900040100\***Setup Start **\*NS1\***

Revision ID: U/R

Stop **\*NS2\***

Item Name: Crosstube Installation, High Fwd

Start Date: 15/03/2012 Start Qty: 1.00 **\*1\***

Cust Item ID:

Required Date: 04/04/2012 Req'd Qty: 1.00 **\*1\***

Customer:

Reference:

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Run Start **\*NR1\***

QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop **\*NR2\***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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210	QC5- Inspect part completeness to step on W/O	0.00							
-----	---	------	--	--	--	--	--	--	--

**\*210\***

QC	Memo	0.00							
----	------	------	--	--	--	--	--	--	--

Quality Control

220	Pick Kit	0.00							
-----	----------	------	--	--	--	--	--	--	--

**\*220\***

Packaging	Memo	0.00							
-----------	------	------	--	--	--	--	--	--	--

Packaging

230	QC4- 100% Inspect kits for completeness	0.00							
-----	---	------	--	--	--	--	--	--	--

**\*230\***

QC	Memo	0.00							
----	------	------	--	--	--	--	--	--	--

Quality Control

12-06-24

12-06-25

12-06-25

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
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NOTE: Date & initial all entries

# Work Order ID 81517

**\*81517\***

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March-15-12 8:42:50 AM

Item ID: D350-748-101

Accept

**\*N900040100\***

Setup Start **\*NS1\***

Revision ID: U/R

Stop **\*NS2\***

Item Name: Crosstube Installation, High Fwd

Start Date: 15/03/2012 Start Qty: 1.00 **\*1\***

Cust Item ID:

Required Date: 04/04/2012 Req'd Qty: 1.00 **\*1\***

Customer:

Reference:

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Run Start **\*NR1\***

QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop **\*NR2\***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
240	Packaging	0.00							
<b>*240*</b>									
Packaging	Memo	0.00							
Packaging	Identify and pack for shipping as per PPP D350-748-101								
	Location: _____								
	PPP Rev: <u>    C    </u>								
250	QC21- Final Inspection - Work Order Release	0.00							
<b>*250*</b>									
QC	Memo	0.00							
Quality Control									

12/06/25

MLJ 12/06/25

mf  
12-06-25

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
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# Picklist Print

March-15-12 8:42:53 AM

Page 1

Work Order ID: 81517

**\*81517\***

Parent Item: D350-748-101

**\*D350-748-101\***

Parent Item Name: Crosstube Installation, High Fwd

Start Date: 15/03/2012

Required Date: 04/04/2012

Start Qty: 1.00

Required Qty: 1.00

## Comments:

IPP Rev:A New Issue 06-07-05 JLM  
 IPP Rev:B Update qty of MS21042L5 06-09-12 KJ  
 IPP Rev:C Rev B 07-11-15 DD  
 IPP Rev D Combined manufacturing 08.04.02 EC verified by: DD  
 IPP Rev:E 08-06-24 revD as per dwg DD verified by:EC IPP Rev:F  
 10.08.04 added QSI010 4.3 DD verf:EC

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D350-748-141TRN		Manufactured	No		B79010	110	Each	0.0000	1	1			
<b>*D350-748-141TRN*</b>									**			Jw 12-5-9	
Crosstube Turning Detail													
ALS4-1032-225		Purchased	No			200	Each	1,102.000	1	1			
<b>*AI S4-1032-225*</b>									**			AB 12-6-22	
Insert													
					118520						①		
				<u>Location</u>		<u>Loc Qty</u>	<u>Loc Code</u>						
				ST281		1019							
					108696	146							
					110768	62							
					118386	55							
					118966	68							
					120671	688							
				ST282		83							
					120410	70							
					120451	13							
AN960JD10	NAS1149D0363J	Purchased	No			200	Each	0.0000	1	1			
<b>*AN960.ID10*</b>									**			AB 12-6-22	
Washer					121524						①		

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

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March-15-12 8:42:53 AM

Page 2

Work Order ID: 81517

**\*81517\***

Parent Item: D350-748-101

**\*D350-748-101\***

Parent Item Name: Crosstube Installation, High Fwd

Start Date: 15/03/2012

Required Date: 04/04/2012

Start Qty: 1.00

Required Qty: 1.00

D2856-400

Manufactured No

200 f

199.5445 1.181 1.243158

**\*D2856-400\***

Abrasion Strip

\*\*

AS 12-6-22

(1.2)

Location

Loc Qty

Loc Code

ST409

199.5445

63735

0.6696

68076

0.3149

71164

8.46

79551

190.1

D3502-1

Manufactured No

200 Each

39.0000 2 2

**\*D3502-1\***

Support

\*\*

AS 12-6-22

(2)

Location

Loc Qty

Loc Code

ST051

39

73419

19

74873

20

MS21920-20

Purchased No

200 Each

60.0000 2 2

**\*MS21920-20\***

Clamp (per MIL-DTL-8783C)

\*\*

AS 12-6-22

(2)

Location

Loc Qty

Loc Code

LG050

60

116799

8

120475

2

120676

50

March-15-12 8:42:53 AM

Shop Packet Print

Page 2



W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

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Parent Item: D350-748-101

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Parent Item Name: Crosstube Installation, High Fwd

Start Date: 15/03/2012

Required Date: 04/04/2012

Start Qty: 1.00

Required Qty: 1.00

MS27039-1-10

Purchased

No

200

Each

258.0000

1

1

\*MS27039-1-10\*

Screw

\*\*

①

As 12-6-22

122027

Location

Loc Qty

Loc Code

GA

100

120449

100

ST291

158

120120

158

AN4-41A

Purchased

No

220

Each

387.0000

8

\*AN4-41A\*

Bolt

\*\*

8  
SP

Location

Loc Qty

Loc Code

ST360

387

115108

3

115705

7

117619

27

118451

50

118838

50

119328

100

120423

150

8

AN4-6A

Purchased

No

220

Each

1,649.000

16

16

\*AN4-6A\*

Bolt

\*\*

12/6/22 SP

Location

Loc Qty

Loc Code

ST356

1649

119017

1649

16

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

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Parent Item: D350-748-101

**\*D350-748-101\***

Parent Item Name: Crosstube Installation, High Fwd

Start Date: 15/03/2012

Required Date: 04/04/2012

Start Qty: 1.00

Required Qty: 1.00

AN5-32A Purchased No

220 Each

256.0000 4

**\*AN5-32A\***

Bolt

\*\*

Location

Loc Qty

Loc Code

ST339

256

119328

100

119862

50

120423

75

120717

1

120910

30

AN960JD416 NAS1149D0463J Purchased No

220 Each

14.0000 32

**\*AN960.ID416\***

Washer

\*\*

Location

Loc Qty

Loc Code

ST351

14

116289

14

AN960JD516 NAS1149D0563J Purchased No

220 Each

0.0000 8

**\*AN960.ID516\***

Washer

\*\*

D3500-1 Manufactured No

220 Each

35.0000 4

**\*D3500-1\***

Saddle

\*\*

Location

Loc Qty

Loc Code

ST424

35

73406

8

76000

27

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

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**\*81517\***

Parent Item: D350-748-101

**\*D350-748-101\***

Parent Item Name: Crosstube Installation, High Fwd

Start Date: 15/03/2012

Required Date: 04/04/2012

Start Qty: 1.00

Required Qty: 1.00

D3501-1 Manufactured No

220 Each

361.0000 16 16

**\*D3501-1\***

Bushing

\*\*

*B854144*

Location

Loc Qty

Loc Code

ST051

361

67757

4

70682

83

73391

6

74866

207

77033

61

MS21042L4

Purchased No

220 Each

5,585.000 24 24

**\*MS21042L 4\***

Nut

\*\*

*M121444*

Location

Loc Qty

Loc Code

ST300

5585

117441

51

117601

157

117885

16

118451

133

119017

232

119075

2996

121011

2000

MS21042L5

Purchased No

220 Each

1,602.000 4 4

**\*MS21042L 5\***

Nut

\*\*

*12/6/20*

Location

Loc Qty

Loc Code

ST300

1602

116105

5

116548

43

117611

42

118179

12

119109

1500

March-15-12 8:42:53 AM

Shop Packet Print

Page 5

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

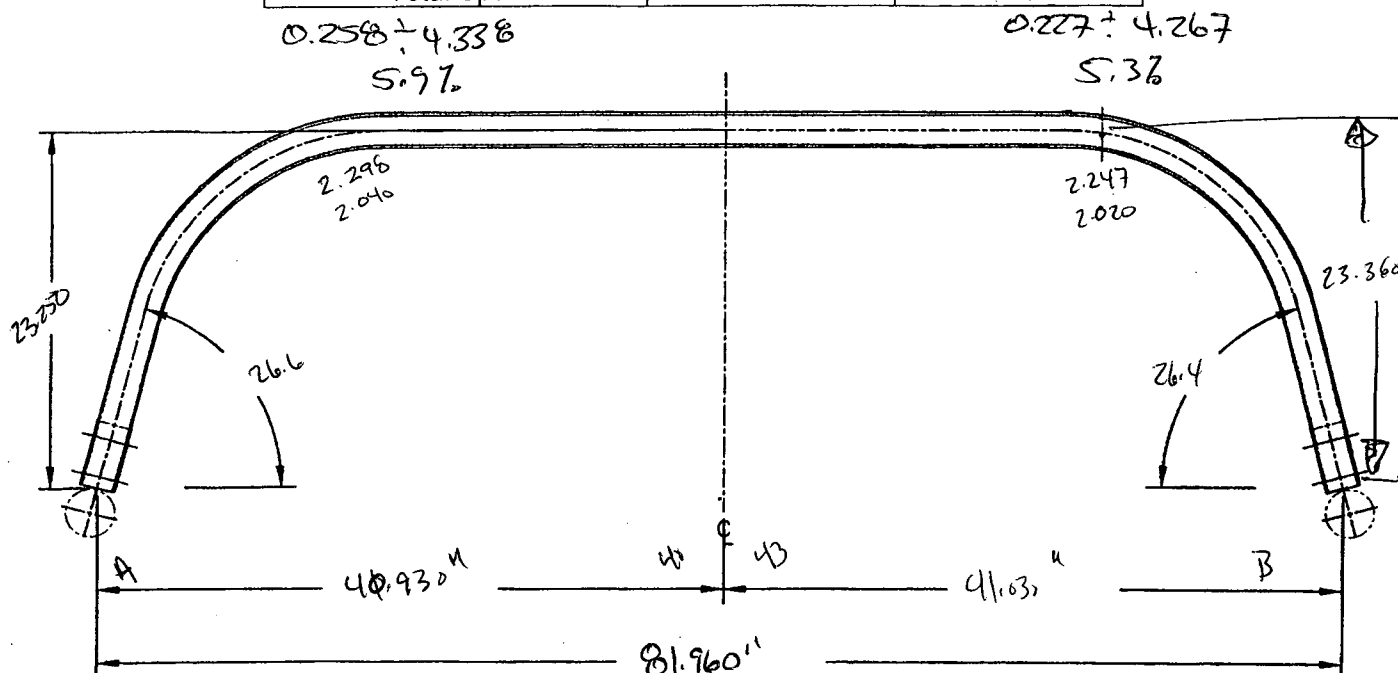
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NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

DART AEROSPACE LTD		Work Order:	E1517
Description: Crosstube High Fwd (AS350/355)		Part Number:	D350-748-101
Inspection Dwg: D350-748-141 Rev: F		Page 1 of 1	

Required Dimension	Min	Max
Height	23.13	23.37
1/2 Span	40.78	41.02
Angle	75	77
Total Span	81.56	82.04



Comments
Side A = $5.9\%$ crush @ 40 passes
Side B = $5.3\%$ crush @ 43 passes
twist = $0.333$
OK CP 12.05.10 $\Phi$ 51072

QC15 Inspection	$\delta$
Date	12/05/10

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	10.08.23	Dwg Rev updated	KJ	
C	11.11.07	Dwg Rev updated	KJ	



W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

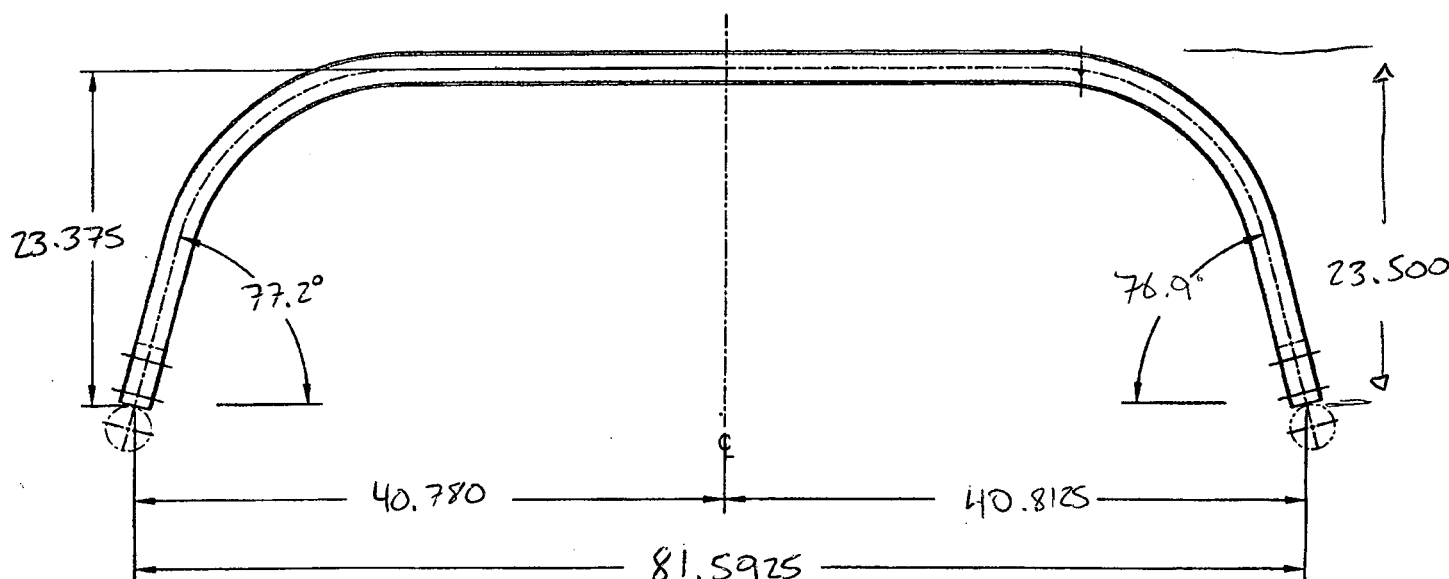
Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B		Sign & Date	Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng				

NOTE: Date & initial all entries

<b>DART AEROSPACE LTD</b>	<b>Work Order:</b>	81514
<b>Description:</b> Crosstube High Fwd (AS350/355)	<b>Part Number:</b>	D350-748-101
<b>Inspection Dwg:</b> D350-748-141	<b>Rev:</b> F	<b>Page 1 of 1</b>

Required Dimension	Min	Max
Height	23.13	23.37
1/2 Span	40.78	41.02
Angle	75	77
Total Span	81.56	82.04



Comments
Twist = 0.025
Acceptable 12-05-17 P51012

QC15 Inspection	5
Date	12/05/17

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	10.08.23	Dwg Rev updated	KJ	
C	11.11.07	Dwg Rev updated	KJ	



Item	Qty -141	Part Number	Description
1	X	D350-748-141	CROSSTUBE ASSEMBLY (AS 350/355 HI FWD)
2	1	D6015-125	CROSSTUBE (OR D6017-115)
3	2	D3502-1	SUPPORT
4	2	D2856-400-710	ABRASION STRIP
5	1	AELS-1032-225	INSERT
6	1	NAS1149D0363J	WASHER (OR AN960JD10)
7	2	MS21920-20	CLAMP (PER DART SPEC. M-MS21920-20)
8	1	MS27039-1-10	SCREW

# GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6015-125 OR D6017-115  
FINISHED LENGTH = 110.270±0.06
- 2) FINISH: MAGNETIC PARTICLE INSPECT PER DART QSI 038 4.2  
CADMIUM PLATE PER AMS-QQ-P-416B, CLASS 1, TYPE II  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART QSI 005 4.2
- 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- 6) IDENTIFICATION: DART PART NUMBER "D350-748-141" AND BATCH NUMBER ON INSIDE OF CUFF  
PER DART QSI 044 6.4 (VIBRATING STYLUS)
- 7) WEIGHT: 30.45 lbs
- 8) PART IS SYMMETRIC ABOUT CENTERLINE, EXCEPT FOR Ø0.297 HOLE.
- 9) BLEND OUT ALL EDGES FROM MACHINING LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.  
NOTE: ALL HOLES ARE DRILLED AFTER BENDING.
- 10) BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO  
BENDING IS 6% BASED ON O.D.
- 11) HEAT TREAT TO MIN. 180 KSI PER MIL-T-6736 OR AMS 2759-1C AFTER TURNING. ACCEPTABLE TO  
VERIFY TENSILE STRENGTH BY HARDNESS TEST PER ASTM E18 TO 40-45 HRC.
- 12) INSTALL D2856-400-710 ABRASION STRIPS WITH A GAP ON BOTTOM SIDE OF CROSSTUBE,  
CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
- 13) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE  
OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES,  
NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY.  
CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE  
MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO  
CRACKING/CHIPPING/GROOVES.
- 14) TORQUE CLAMPS 60 TO 80 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT  
NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.
- 15) MAX TWIST AFTER BENDING: WITH XTUBE LAYED FLAT ON SURFACE, THE DIFFERENCE BETWEEN  
CUFF HEIGHTS FROM THE SURFACE MAY BE NO LARGER THAN 0.25 (ZN C1-3).

SHOP COPY  
RETURN TO  
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UNCONTROLLED COPY  
SUBJECT TO AMENDMENT  
WITHOUT NOTICE  
WORK ORDER  
NO. 81517 MLJ  
12/03/13

UNDER REVIEW

RELEASED  
2011-01-18

F	ADD HRC TEST OPTION (B8-1) PER PAR 09-040, ADD TWIST LIMIT (A8-1, C1-3), ADD D6015-125 OPTION (C8-1), STOCK DIM NOW MACHINED (D1-4)	CP	10.11.23
E	REVISE GENERAL NOTES; UPDATE TO CURRENT ADD STANDARDS; RELOCATED FLAG #6 PER PAR 08-046 (ZN A6-3); TOLERANCES (ZN C6-3, D1-3)	RF	09.09.30
D	MAG. PARTICLE AND CAD PLATE AS MFD.	CP	06.10.31
C	ADD CAD PLATING	CP	06.08.14
B	ADD D6017-115 & PRIME AND PAINT	CP	06.06.30
A	NEW ISSUE	CP	06.03.31
REV.	DESCRIPTION	BY	DATE
DESIGN	<u>JP</u>	<b>DART AEROSPACE LTD</b> HAWKESBURY, ONTARIO, CANADA DRAWING NO. REV. F D350-748-141 SHEET 1 OF 4 TITLE SCALE CROSSTUBE (AS 350/355 HI FWD) NTS COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.	
DRAWN	<u>JP</u>		
CHECKED	<u>JP</u>		
MFG. APPR.	<u>JP</u>		
APPROVED	<u>JP</u>		
DE APPR.	<u>JP</u>		
DATE	10.11.23		

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

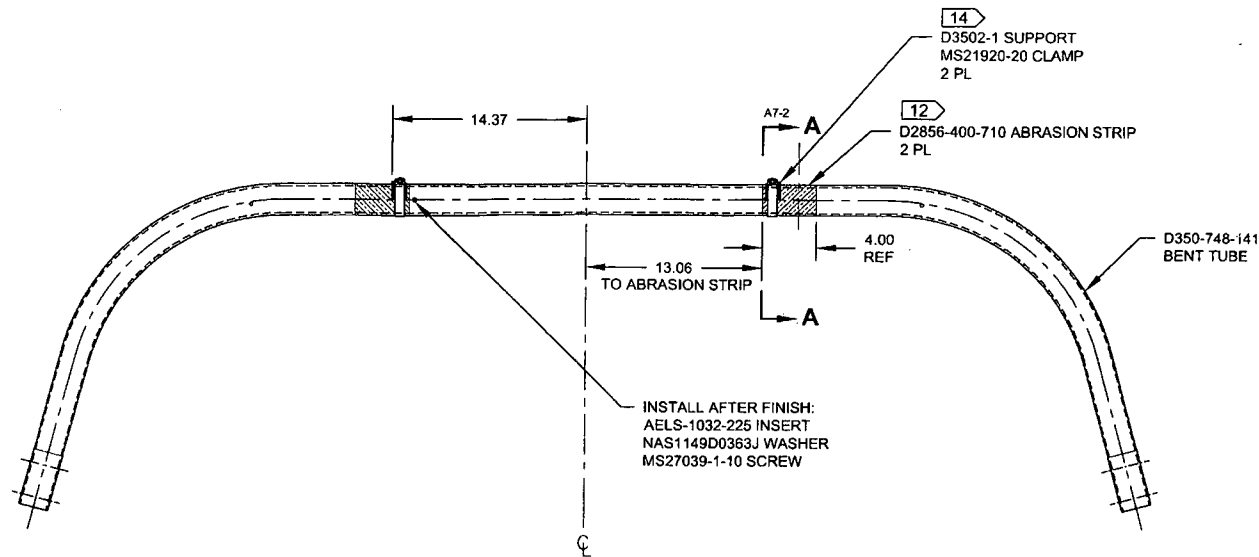
Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

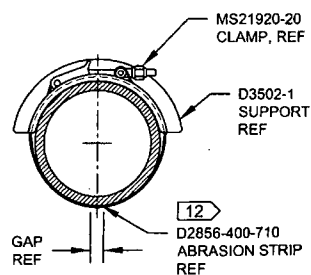
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DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

81517



**D350-748-141  
ASSEMBLY DETAIL**



**SECTION A-A** D4-2  
SCALE 4X

UNDER REVIEW

07.11

**RELEASED**  
2011-01-18

DESIGN	92	<b>DART AEROSPACE LTD</b>	
DRAWN	92	HAWKESBURY, ONTARIO, CANADA	
CHECKED	92	DRAWING NO.	REV. F
MFG. APPR.	92	D350-748-141	SHEET 2 OF 4
APPROVED	92	TITLE	SCALE
DE APPR.	92	CROSSTUBE (AS 350/355 HI FWD)	NTS
DATE	10.11.23	<small>COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.</small>	

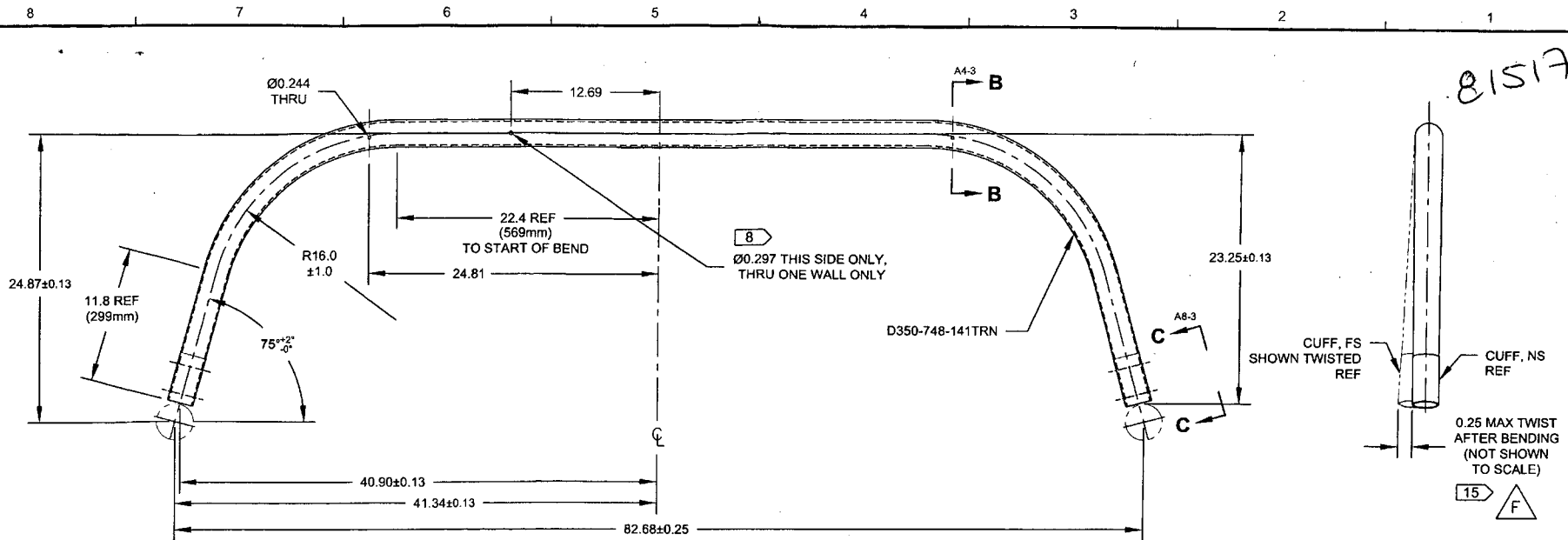
W/O: <u>4-12-0</u>		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

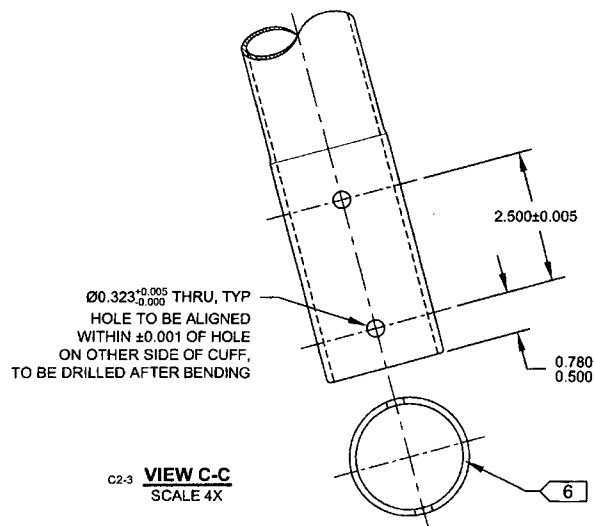
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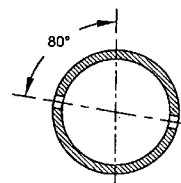
**NOTE:** Date & initial all entries



**D350-748-141**  
**BENDING AND DRILLING DETAIL** 10



C2-3 **VIEW C-C**  
 SCALE 4X



**SECTION B-B** D3-3  
 SCALE 4X

UNDER REVIEW  
 11.07.12

RELEASED  
 2011-01-18

DESIGN	<i>g</i>	<b>DART AEROSPACE LTD</b>	
DRAWN	<i>g</i>	HAWKESBURY, ONTARIO, CANADA	
CHECKED	<i>g</i>	DRAWING NO.	REV. F
MFG APPR.	<i>g</i>	D350-748-141	SHEET 3 OF 4
APPROVED	<i>g</i>	TITLE	SCALE
DE APPR.	<i>g</i>	CROSSTUBE (AS 350/355 HI FWD)	NTS
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W/O: 1214		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries



W/O: 212		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

**METCOR INC.**  
**560 BOUL. ARTHUR-SAUVÉ**  
**ST-EUSTACHE, QC, J7R 5A8**  
 Tel: 450-473-1884 / Fax: 450-491-5498

**Certificat de Conformité Détaillé**  
 Detailed Certificate of Compliance

BON DE TRAVAIL order	CHARGEMENT load
175881	1

CLIENT / customer 215

DART AEROSPACE  
 1270 ABERDEEN  
 HAWKESBURY

ON K6A 1K7

LIVRÉ À / shipped to:

DART AEROSPACE  
 1270 ABERDEEN  
 HAWKESBURY

ON K6A 1K7

COMMANDE DU CLIENT customer po	BON DE LIVRAISON DU CLIENT customer shipper no.	MATÉRIEL material	CODE DE TRAITEMENT mat'l heat code	NUMÉRO DE LOT lot number
16942		Steel		

**SPÉCIFICATIONS DU PROCÉDÉ**  
 processing specifications

STRESS REL

SAE AMS 2759/1 REV.E

EXIGENCE / requirement SPÉCIFICATIONS / specified TESTS EXÉCUTÉS / performed RÉSULTATS DE TESTS / results

Visual

QUANTITÉ quantity	POIDS weight	DESCRIPTION DES PIÈCES parts description
7	210	D350-748-101 (1) CROSSTUBE  (1) D350-748-101 CROSSTUBE  (1) D350-748-201 CROSS TUBE  (1) D350-748-201 CROSS TUBE  (1) D350-748-201 CROSS TUBE  (1) D350-748-201 CROSS TUBE  (1) D350-748-201 CROSS TUBE  (1) D350-748-201 CROSS TUBE  CONTENANT: 1 PALETTE

Operation	Temp. spécifiée Specified Temp	Temps de trempage Spécifié Specified Soak Temp	Atmosphère	Carbone Carbon Potential	Q-Media Q-Temp	Four # Furnace #	Date Départ Start Date	Heure d'entrée Time In	Heure de sortie Time Out	Date Complétée Date complete
1,00 CONT. INIT.	LAVAGE		si nécessaire							

**METCOR INC.**  
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ON K6A 1K7

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HAWKESBURY

ON K6A 1K7

Operation	Temp. spécifiée Specified Temp	Temps de trempage Spécifié Specified Soak Temp	Atmosphère	Carbone Carbon Potential	Q-Media Q-Temp	Four # Furnace #	Date Départ Start Date	Heure d'entrée Time In	Heure de sortie Time Out	Date Complétée Date complete
2,00 PREPARINC	COMPTAGE									
3,00 STRESS RE	650	2 hrs 30 minutes	air			701				
4,00 FINAL INSP							05-11-2012			05-11-2012

**COMMENTAIRES / comments**

ALL THE HEAT TREATMENT PROCESSING PERFORMED ON THIS ORDER WAS ACCOMPLISHED USING HEAT TREATMENT EQUIPEMENT THAT MEETS THE REQUIREMENTS OF AMS 2759. ALL THE HEAT TREATMENT OPERATIONS WERE ACCOMPLISHED IN ACCORDANCE WITH THE REQUESTED/REQUIRED HEAT TREATMENT SPECIFICATION AND ALL REQUIRED VERIFICATIONS TEST HAVE BEEN PERFORMED AND DOCUMENTED. NO UNAUTHORIZED CHANGES OR DEVIATIONS TO REQUIRED HEAT TREATMENT SPECIFICATIONS OR PROCEDURES HAVE BEEN PERFORMED.

APPROUVÉ par / Approved by:



MET  
16

DATE: 2012-05-11

/ Nous certifions que toute l'information comprise sur ce rapport est exacte et conforme aux requis du client./We certify that all the information on this report is exact and in accordance with the order requirements.

**CERTIFICATE OF  
CONFORMANCE**

**CADORATH PLATING CO. LTD.  
2150 LOGAN AVENUE  
WINNIPEG, MANITOBA R2J-0J1**

**DATE:** Jun-12-2012

**CONSIGNED TO:** Dart Aerospace Ltd.  
1270 Aberdeen St.  
Hawksbury, ON K6A 1K7

**W/O #:** 114970

**INVOICE #:** 60875

**CONTRACT OR  
PURCHASE ORDER #** PO17084

**DESCRIPTION:** CROSSTUBE

**QTY** 1

**P/N #** d350-748-101

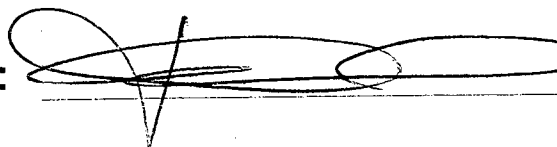

**S/N #** 81517

STRESS RELIEVE HEAT CHART # 12-546. MPI-IAW ASTM-E-1444.  
CADMIUM PLATE IAW AMS-QQP-416C TYPE 2 YELLOW CLASS.  
BAKE HEAT CHART # 12-573. MPI IAW ASTM-E1444.

*8/16/10*

**CERTIFICATE:** I certify that the items indicated here on have been inspected and tested and conform to all specifications and requirements detailed on the contract or purchase order.

**Approved Inspector:**



# LIQUID PENETRANT TEST REPORT

P-12188

PAGE 1 OF 1

DATE June 19/2017 TIME AM ☒ PM ☐  
ACUREN JOB NO. 190-12-0265  
PO/NO. 17084  
WORK LOCATION SAVE  
ACCEPTANCE STD. ASTM 1417/BS 038 REV./DATE 2005

NT  
ENTION  
ADDRESS  
PROJECT  
ITEM(S) EXAMINED

F.P.I. on cross tubes  
(10) Pcs SEE RESULTS

JOB DESCRIPTION

PROCEDURE NO. LT002 REV./DATE 2008

TECHNIQUE NO. LT002 REV./DATE 2008

PART NO.

MATERIAL

THICKNESS VARIOUS

SCOPE

SEE RESULTS  
A WET FLUORESCENT LIQUID PENETRANT EXAMINATION  
WAS COMPLETED 100% ON EXTERNAL SURFACE

TEST DETAILS

METHOD ☒ FLUORESCENT ☐ VISIBLE  
FAMILY BRAND MAGNAFLUX  
PENETRANT 2LG7 MINIMUM DWELL TIME 45 MIN.  
PENETRANT REMOVER H2O MINIMUM DRY TIME >10 MIN.  
DEVELOPER SKD 52 MINIMUM DWELL TIME 10 MIN.  
DEVELOPER TYPE ☒ NON AQUEOUS ☐ AQUEOUS ☐ DRY  
☒ WATER WASH ☐ SOLVENT REMOVABLE ☐ POST EMULSIFIED  
BLACK LIGHT S/N 16459 ☒ OUTPUT > 1000  $\mu$ W/cm<sup>2</sup> ☐ AMBIENT < 2 fc  
LIGHTING EQUIP. ☐ FLASHLIGHT ☐ TROUBLELIGHT ☐ OUTPUT > 100 fc @ SURF.  
OTHER LAB NO  
LIGHT METER S/N 1098866 CAL DUE DATE July 2017

TEST SURFACE

SURFACE CONDITION ☐ AS GROUND ☐ AS WELDED ☒ MACHINED ☐ SHOT BLASTED ☒ CLEAN BARE METAL  
SURFACE TEMPERATURE ☐ < -4°C/ 20°F ☐ -4°C/ 20°F TO 10°C/ 50°F ☒ 10°C/ 50°F TO 52°C/ 125°F ☐ > 52°C/ 125°F

RESULTS-

☒ METRIC ☐ IMPERIAL

W.O.#s - CROSS TUBES.

1	-	"	"	83701	✓
1	-	"	"	83699	✓
1	-	"	"	83698	✓
1	-	"	"	81517	✓
1	-	"	"	81514	✓
1	-	"	"	84380	✓

12-06-19

## Scope of Services

The agreement of Acuren Group Inc. to perform services extends only to those services provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested services. It is expected that all descriptions, comments and expressions of opinion reflect the opinions or observations of Acuren Group Inc. based on information and assumptions supplied by the owner/operator and are not intended nor can they be taken as representations or warranties. Acuren Group Inc. is not assuming any responsibilities of the owner/operator and the owner/operator retains complete responsibility for the engineering, manufacture, repair and use decisions as data or other information provided by Acuren Group Inc. In no event shall Acuren Group Inc.'s liability in respect of the services referred to herein exceed the amount paid for such services.

## Standard of Care

In performing the services provided, Acuren Group Inc. uses the degree, care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, express or implied, is made or intended by Acuren Group Inc.

SIGNATURES

CLIENT REPRESENTATIVE

Matthew Murdoch

PRINT

SIGNATURE

TECHNICIAN (SIGNATURE):

Mike Lattin

NAME (PRINT):

1<sup>ST</sup> TECHNICIAN

2<sup>ND</sup> TECHNICIAN

CGSB LEVEL

SNT LEVEL

CGSB LEVEL

SNT LEVEL

CGSB REG. No

10206

CGSB REG. No

DTR # E 63501

REPORT

REVIEWED BY:

NAME

INIT

CLIENT COPY

CANARY - OFFICE COPY

PINK - TECHNICIAN COPY

GOLD - OFFICE COPY